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ABSTRACT

This report lists the results of a 50 state survey on education's response to the energy crisis conducted in December 1973. The survey asked respondents in state departments of education and state higher education executive offices to report facts about their state's response to the energy crisis, as well as their own opinions and projections. Seventy-two respondents in 48 states sent back completed questionnaires from which information was extracted for this report. Among the topics discussed are action that has been taken, transportation and heating, contingency plans formulated by states, state legislative changes, gasoline shortages, rising costs, education and the economy, ecology, unique scheduling alternatives, and lesson plans. A copy of the survey instrument is included in the appendix. (BT)

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EDUCATION'S RESPONSE TO THE ENERGY CRISIS

A Survey of the States

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EDUCATION'S RESPONSE TO THE ENERGY CRISIS

"We are facing a very difficult situation, but one which also offers opportunities. Public education is vital to the survival of our democratic society. We have an opportunity to show the way by example and by developing awareness in our students, and to show that education has a high priority in our society."

*- Fred G. Burke
Commissioner of Education, Rhode Island*

Introduction

In December 1973 the Education Commission of the States conducted a 50-state survey on education's response to the energy crisis, which asked respondents in state departments of education and state higher education executive offices to report facts about their state's response, as well as their own opinions and projections. Seventy-two respondents in 48 states sent back completed questionnaires from which information was extracted for this report. A copy of the survey instrument is included in the appendix.

For further information on the responses to this survey, contact Doris M. Ross, Department of Research and Information Services, Education Commission of the States.

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ENERGY CRISIS OR INFORMATION GAP?

Because the questionnaire called for opinion and conjecture as well as factual information, some of the respondents complained about the general lack of information relating to the energy crisis, and of discrepancies and inconsistencies in the small amount of information that has been available. Examples of elementary-secondary respondents' comments are:

West Virginia: "The long-range effect cannot be known at this time. It will depend on the adequacy of energy supplies and the actions taken by the federal and state government."

Florida: "Until the extent of the severity is known, there is no way to accurately predict the effects upon school operations."

Rhode Island: "Lack of reliable long range information relative to supplies of fuel makes it difficult to forecast We tend to be optimistic, lacking specific information."

Vermont: "It appears to us that all school districts—all states—are groping in the dark—no one can give any concrete indication as to what the monthly fuel oil and gasoline allocations will be."

Maryland: "We simply don't have enough data to respond to this Information out of Washington is so skimpy that we cannot make judgments."

Massachusetts: "Our most immediate problem is one of information. The federal government does not have statistical information, or has not made it available, or what is available is conflicting. The oil companies are not providing information relating to supply. And all that is being discussed is national averages"

ACTION HAS BEEN TAKEN

But whether the available information is or is not adequate, survey responses indicated that standard energy conservation measures are almost universally in use across the country, and were triggered in each state by a governor's executive order or request, through a state agency or at the local level. Representative samples of energy conservation guidelines are included in the appendix; most states are following similar versions of these.

Some 30 states reported specific governor's action on the energy crisis, ranging from orders to reduce speed limits to delineation of energy conservation measures to be employed by state agencies. Tennessee's guidelines include lowering hot water temperature to a cool 100° (most recommendations are for 125°), and Florida's State Department of Education set a pokey 40 m.p.h. for school buses (most recommendations are for 50-55 m.p.h.)!

The Maryland executive order extended the Christmas vacation to include Jan. 2 through 4; it included private schools and indicated that makeup of lost days would be required.*

Energy crisis commissions, committees, task forces and coordinators seem to abound at all levels of government. A top-level group in Idaho is a task force on the

*ECS has a copy of the Maryland executive order, as well as copies of executive orders or requests affecting schools only peripherally from Colorado, Delaware, Wyoming, Iowa, Washington and Oregon. Other states did not send exact copies.

energy crisis in the state department of education; in Massachusetts, the Governor's Educational Advisory Task Force on the Energy Crisis was formed; and Maryland reports that its Governor's Public School Energy Task Force has designed conservation guidelines for three phases of the energy shortage—short-, middle- and long-range.

Other top-level groups, such as those reported by South Dakota, Louisiana, Florida, Kansas, New Hampshire and Delaware, were created for more general purposes related to the energy crisis and are wrestling with fuel inventories and allocations, further and more extensive conservation measures and the rules and regulations necessary to implement them. Some of these groups and others at regional and local levels are conducting meetings, seminars and workshops on every conceivable facet of the crisis. Brainstorming sessions are unveiling unique approaches for the education community to consider if normal elementary, secondary and postsecondary school operations are further disrupted by the energy crisis.

Because of the tremendous amount of publicity the energy crisis has received, and because of the countrywide sameness of the initial reaction of the education community (see appendix), this report will deal with phases of the crisis that go beyond the immediate situation.

TRANSPORTATION AND HEATING SHARE THE SPOTLIGHT

Because the gross effect of the energy crisis on education seems to vary from state to state, it was difficult to quantify the responses to the question dealing with short- and long-term effects. Generally speaking, however, it can be said that more than half of the states reported transportation as the most serious short- and/or long-term energy crisis; a dozen reported heating as a major concern; and the remainder felt that both areas would be vital. The following statements provide some indication of state concerns:

Colorado Elementary-Secondary Respondent (ES): "Severe shortage of gasoline and propane could cause school closings this year. The immediate effect is to curtail all activities we have been trying to implement: better use of school facilities; more use of community resources; limiting student participation in extracurricular activities; cutting back on physical, band, speech and other activities requiring the use of transportation."

Iowa (ES): "Transportation and heating will hit Iowa the hardest. Already, three schools have had a 'scare' from not having more than two days' supply of gas available for school buses. Gas was obtained before the storage tanks were drained—but with gas less plentiful from week to week, 'busing' could be seriously restricted. Many of our schools operate on fuel oil and many operate with 'interruptible' natural gas. Thus, in periods of extremely cold weather, those schools are forced to 'switch' to oil—a fuel that is already very limited in supply. Consequently, the additional drain on our fuel oil supplies may be so critical that schools may have to close for a few days or even a few weeks. Such severe change will, indeed, have a resulting effect on the regular school routine. It probably will result in a longer school year, unless by legislative action a shorter school year is approved."

Utah (ES): "The supply of automotive fuels . . . may present a problem. Utah is a rural state, and 95,000 students are bused daily. The total annual mileage for all schools is 10.2 million."

Alabama Postsecondary Respondent (PS): "I expect the shortage of gasoline will have the greatest impact here. The junior colleges and technical schools provide bus

transportation for students. There may be more students needing and wanting transportation and not enough gasoline to provide the buses. Enrollment in commuter institutions may be affected as prices rise and gasoline grows scarce."

Oregon (PS): "The area of the energy crisis which affects some state institutions the greatest is heating, especially those institutions on interruptible gas service. The indications are that gas service will be interrupted for about 10 times as long in the 1973-74 heating season than the 1972-73 heating season. Further, the oil supplier for most of these institutions has been able to deliver only somewhat less than the previous year's total. Until such time as some allocation methods are established, institutional personnel will continue to be extremely busy seeking additional supplies and stretching existing supplies by a number of methods, many of which are time-consuming. The effect has been to reduce to six hours per day the supply of steam to noncritical areas in addition to lower temperatures, etc."

Missouri (ES): "At the moment, it appears that school districts having an interruptible service contract with a natural gas company will be hit the hardest. If gasoline becomes harder to obtain, this would also be a serious problem in the education of Missouri young people. At this time, it would be difficult to determine the short- and long-term effects on the educational process. We certainly feel that the education of our young people should be one of very high priority. The future of our entire nation is in the hands of today's learners. Therefore, it is imperative that our educational standards be maintained and not permitted to become diluted at this time."

Maine (PS): "Maine expects a bad winter because of our dependence on overseas oil. Heating (including electricity) has to be the critical area, but we must have gasoline to move goods or we will run out of food and lose employment as factories close. In other words, we have a CRISIS. If oil literally runs out in February, colleges will have to close before factories, hospitals, homes. This will cause grave academic and employment problems. Perhaps new academic calendars will result with winter rather than summer vacations."

Massachusetts (PS): "Shortages in gasoline are currently being felt by commuting students. The potential for closing institutions due to cold is very real. We are told that 85 per cent of our residual oil is imported and that one-half of this is affected by the Arab cutoff. This means that rolling blackouts of electricity are a likely event. In the longer term, the energy crisis is going to leave many scars."

California (ES): "If the crisis continues over a long period of time, it could result in substantial changes in the school day, week or year. That is, we may find it necessary to have a longer school day for four days a week, or perhaps a long vacation during the winter, rather than during the summer as at present. As fuel becomes more and more scarce, it is possible that the curriculum, itself, might be affected. For instance, art classes using kilns might be eliminated or science classes which rely heavily upon field trips may have to be drastically revised. The use of busing for integration purposes might have to be halted, as indeed also might the busing of all children now being transported to and from school be curtailed or completely stopped. As many school bus routes in California are above 50 miles in length (one is 84 miles long), it is impractical to expect all children to walk to school. Thus, it is possible that some children who lack the necessary transportation may be denied the opportunity to attend school."

Missouri (PS): "Fuel oil will be very short. Coal will be used more. Natural gas: no problems anticipated for homes, but shutoff is expected of customers on interruptible rates. We are anticipating the worst and planning accordingly. We believe conservation in combined efforts of all society will alleviate any real suffering, but are preparing for real emergency, if it becomes a reality. Gasoline will be short, and perhaps federal law may be imposed that will curtail much transportation."

STATES FORMULATE CONTINGENCY PLANS

Whether the problem is one of getting the student to school, keeping him comfortable (warm or cool) after he gets there or paying the bill, the fact remains that the traditional education process may well be altered by a continuing or worsening energy crisis. This has both good and bad implications, which are revealed by a review of some of the contingency plans being developed across the country.

One of the most obvious ways for schools to conserve energy is to regulate the times the buildings (and the buses) are in use by adjusting the school day, week or year (a shortened school day in cold weather, a four-day week, changes in the length of the school year, changes in vacation periods). A few of the states responding to the ECS survey, and some isolated individual districts, had already dismissed classes on cold days or extended their Christmas vacations for a few days without particularly dramatic impact.

A few postsecondary education institutions are adjusting their school calendar this year, while many more are considering adjustments for next year should the energy shortage continue. For example, New Hampshire's postsecondary respondent reports that the "academic year calendar was adjusted on the university and the state colleges"—by compressing the first semester to conclude by Dec. 22 and beginning the second one on Feb. 4, adjusting vacation and end-of-second-semester schedules to make up lost time. Athletic schedules have been revised or curtailed as well.

STATE LEGISLATIVE CHANGES

Extensive changes in school time periods present some very real problems with elementary-secondary school attendance laws and school finance. A majority of the 50 states have laws mandating a school year of from 172 to 184 days, with state financial aid to local school districts based on fulfillment of the time requirement. Some state legislation goes even further by defining the length of a class period, school day, school week and school term. In some states, the state board of education is authorized by law to establish these school time schedules.

In the postsecondary schools, degree requirements and school accreditation could be among the areas affected.

Within this kind of framework, then, it is obvious that either the lost time caused by the energy crisis must be made up, or new legislation/regulations must be instituted. Two states reported enactment of special legislation affecting the school year at this point (December 1973); six states reported such legislation under consideration; and one state (Massachusetts) reported changing state board regulations:

Wisconsin (ES): The legislature, in a special session late in 1973, enacted legislation (Chapter 157) relevant to the "Energy Emergency and School Operations. In the event that an energy emergency . . . results in the reduction of fuel supplies that may require curtailment of the operations of public elementary and high schools, the determination as to how to meet such crises shall be made locally by each school system or district. Changes in terms and conditions of employment proposed to meet such crises, other than salaries and wages, shall be negotiated between the school board and the bargaining representative of the employees. Employees of any school system or district in which school operations are curtailed or in which schools are closed due to an energy emergency shall receive full payment of salary or wages under their

employment contracts or arrangements as if there had been no such interruption in closing . . . full state school aids shall be paid to districts that fail during an energy emergency . . . to comply with the days of school required by that section."

Florida (PS): A comprehensive energy emergency proposal under consideration by the Florida Legislature would give the governor authority to declare an energy emergency and to suspend or reschedule public school or university activities and classes, and to waive or suspend the minimum school term requirement.

Minnesota (ES): The governor's office has prepared a legislative proposal that would give the chief state school officer extended power to change the school week, day or year, to control energy use and energy conservation in school buildings, to close buildings and consolidate students and classes, to maintain an energy supply inventory and to assure full payment of state aids in instances where compliance with legislation or the chief state school officer's directives make it impossible for a school district to comply with the minimum school year requirement.

South Dakota (ES): Proposed legislation being prepared by the state department of education would give school boards the authority to declare those days when the school must be closed due to insufficient fuel for part of the school term and to adjust the calendar for the school term to cope with such emergencies. The South Dakota respondent further noted, as did a number of other respondents, that altering school time periods would have an effect on teachers' contracts and the terms provided in them, school accreditation, school finance, etc. He listed possible legislative changes as: (1) amend the definition of school day, week and term, and the methods of making up days by allowing the state board of education to modify them whenever the governor declared an emergency to exist; (2) repeal all the laws pertaining to the school day and school term and allow the state board of education to designate them; (3) amend the section on days of legal discontinuance to allow for this fuel crisis; and (4) amend the section on days of legal discontinuance to provide for a more general statement on "Acts of God" to allow for various types of unpredictable situations that might arise.

Massachusetts (ES): The state board of education has adopted emergency regulations that set aside the 180-day minimum school year requirement and placed the length of the school year on an hourly basis, ranging from 900 hours for elementary schools to 1,080 hours for vocational schools (effective Dec. 18, 1973 and applying only to the 1973-74 school year).

Pennsylvania (ES): Senate Bill 1331 has been introduced to give the governor certain emergency powers that include closing, extending or restricting hours for all schools and other public institutions and which, during an emergency, suspend contract provisions of public employees, including teachers.

Maine (PS): The governor's office is proposing legislation to give the governor emergency powers that would include closing of schools, but would not necessarily apply to postsecondary education.

Illinois (ES): House Bill 2109 has been introduced to provide that if a school makes every good faith effort, but cannot procure the energy resources necessary to keep school open for the entire minimum school term, the state aid claim need not be reduced.

North Dakota (ES): Chapter 154, enacted in 1973, provides that "the existence of a state of emergency may be proclaimed by the governor if he finds that an act of God has occurred and that the safety and welfare of the inhabitants of the state or of any portion thereof require the closing of schools or any particular school. Any such emergency shall terminate upon the proclamation of the termination thereof by the governor. Any school district which is located within the boundaries of the territory included within the governor's proclamation of a state of emergency or designated by it may include days actually lost, not to exceed five days, during which school was not

held because of such state of emergency for purposes of the foundation program Any school district in which schools are closed for in excess of five days in any school year because of such a state of emergency shall receive two days of credit for foundation program purposes for each additional day school is held to make up for such lost days." The respondent apparently feels that this legislation would apply to an energy crisis emergency; some other state respondents have indicated that they do not consider their state's "Act of God" legislation specific enough.

Montane (ES) Legislation prepared by the governor's office and already introduced would permit local school districts to operate schools four days a week instead of five during the period needed for the conservation of fuel.

As is obvious from the above examples (note South Dakota and Wisconsin), state legislation changes made necessary by an extended or more acute energy crisis involve more than school time periods.

OUT OF GAS—OUT OF SCHOOL

As noted earlier, the transportation picture appears to be particularly grim should the energy shortage worsen. Primary conservation measures in many states—reduction of speed limits, consolidation of bus routes, elimination of bus service for those students who live close enough to school to walk and cutbacks in field trips and other activities requiring school bus transportation can be tolerated—but not welcomed—as necessary adjustments. Major cutbacks in gasoline and diesel fuel and the resultant busing reduction, of course, would interfere with regular school attendance for students and provide financial problems for school districts in states that base aid to districts on average daily attendance—another legislative problem!

An *Ohio* postsecondary respondent noted: "...the long-term effect (of a continuing gasoline shortage) will be more serious since one of the purposes of education is to expose students to a wide variety of cultural and life alternatives. This exposure is achieved through cultural events (dances, plays, conventions) scheduled at the schools on weekends or evenings. Field trips have been substantially reduced already because of the cost of gas. These trips are most beneficial to the two-year institutions—many of which are located in rural areas. The end result of curtailment of these kinds of activities is a less educated person and a static community."

Noon transportation for kindergarten youngsters is being suspended in some districts, added the *Ohio* elementary-secondary respondent. "Some schools are changing from a half-day kindergarten session to a full day; the former morning groups may attend full-day sessions for three days a week and the afternoon groups attend two days a week. They alternate the arrangement for the following week."

A perhaps unexpected twist to the gasoline shortage was reported by a *Pennsylvania* elementary-secondary respondent: "State law, Act 372, requires that nonpublic school students be transported by public school buses. As a result, school districts are using approximately 20 per cent more gasoline and receiving 10 per cent to 15 per cent less than last year's allocation. This would indicate that school districts are operating on 30 per cent to 35 per cent less fuel than is required. The impact of this may result in temporary school closure several days each month since gasoline is allocated on a monthly basis."

"Over 50 per cent of *Michigan's* elementary and secondary pupils are transported by school buses," said that state's respondent. "Unless provisions are made to provide gasoline in sufficient supply, serious problems will arise." Short-term effects were

identified as "loss of days of student instruction and difficulty of making up and implications for collective negotiations agreements (with teachers)." In the long term, "serious consideration must be given to substantially altering the school year e.g., winter vacations in lieu of summer."

New Jersey's elementary-secondary respondent stated, "With action re fuel oil conservation, it appears we will meet the crisis based upon the present status, which could change. It appears that gasoline will become a more critical item with a direct impact upon pupil transportation."

And in *Nevada*, according to the elementary-secondary respondent, "Transportation departments have already been notified to expect 75 per cent of fuel used in January 1973 for January 1974. Reduced allocations, coupled with increased gas consumption per mile (due to larger vehicles and pollution devices) will necessitate at least a 30 per cent reduction in services in most districts by Feb. 1, 1974. Additional buses are needed now to provide for students eligible for transportation who have used private cars in the past."

RIISING COSTS MULTIPLY PROBLEMS

While some state respondents mentioned the overall effect of a sustained energy crisis on the general economy-- high-shortage states and tourist states would suffer most because of employment problems and the resultant losses in tax revenues for education--many more respondents pointed to the spiraling costs of both heating and transportation fuels as a major problem. State and district transportation budgets are feeling the crunch now; and if prices continue to rise, the general feeling was that "If you can't afford to buy it, it doesn't matter whether or not it's available." State respondents commented:

Alabama (ES): "A number of school systems have had to curtail activities and meet rising costs." *South Dakota (PS)*: "We are not adequately funded for the increased cost of fuel, so we expect emergency legislation to provide these funds." *Nebraska (ES)*: "The cost of gasoline and its availability are posing real problems for Nebraska schools." *New Hampshire (PS)*: "University of New Hampshire system is operating on a very tight budget for 1973-74 and cannot absorb deficits due to unforeseen sharp increases in costs of oil, gas and electricity. Implication is that deficits incurred this year will have to be made up out of 1974-75 operating budgets, and with state appropriations already set for that year, we have no reserve or margin to offset 1973-74 deficits. Long-term effects are primarily financial: we will require increased state appropriations and/or increases in student fees." *Colorado (PS)*: "Increased costs of fuel, as well as the anticipated shortages, have direct effect."

New Mexico (ES): "cost of fuel . . ." *Washington (ES)*: "To date, the problem has not been a lack of supply but increasing costs and a fixed budget. The Seattle School District estimates that heating oil alone will cost the schools an additional \$400,000 if prices were frozen where they are now." *Oregon (PS)*: "The long-term effect will undoubtedly be considerably greater concern for the life-costing of facilities including the supply of heat and other utilities." *Ohio (PS)*: "Already our reports from schools indicate that fuel oil is very difficult and expensive to purchase." *Massachusetts (ES)*: "The governor has submitted legislation to a special session which would grant him broad emergency powers over allocations, credit, prices . . ." *Maryland (ES)*: "We support fuel rationing with a reasonable priority for schools, plus firm price controls. We cannot compete for scarce resources with others whose ability

to pay exceeds our own." *Massachusetts (PS)*: "Capital outlay is already being curtailed or re-evaluated. Budgetary inflation in fuel accounts is out of sight, and will continue." *Montana (PS)*: "An increase in transportation costs and costs of utilities would cause severe budget problems in Montana postsecondary education institutions."

EDUCATION AND THE ECONOMY

Possible implications of a general economic slump were stated:

South Carolina (PS): "The most ominous development could be an economic recession. This will have direct impact on budgets and will undoubtedly curtail growth in quality that has been so long in developing. It will also probably encourage a shift from higher-cost programs and institutions to the lower-cost ones, usually found in public institutions. It could also encourage enrollment as commuters, with students living at home which in turn would affect dormitory occupancy."

Nevada (ES): "In the long run all Nevada will be affected by a significant reduction in taxable income because tourists will not come if gasoline is unavailable. It is this writer's opinion that funds available for education will be seriously reduced resulting in increased class loads, teacher lay-offs and serious reductions in the total educational effort. Nevada has limited energy sources of its own and is a 'using' state. The primary industry, tourism, could be construed to be a nonessential industry, consequently we are doing everything we can to preserve our economy at the present time."

Georgia (PS): "In the long haul, we believe the most serious effect on postsecondary education will be that resulting from a general economic slowdown. One beneficial effect may be that students who now commute may very well decide to move into campus housing facilities due to the shortage of gasoline. If this happens, it could relieve the serious financial situation facing most residential campuses resulting from empty or partially empty housing units."

Hawaii (PS): "Since state economy is dependent on tourism from mainland U.S.A., Japan and Canada, an energy crisis which affects economy will result in a lesser number of tourists and, consequently, a depression in the state's budgetary picture. An economic depression would tend to shift the budget's orientation to welfare rather than education."

ECOLOGY AND ENERGY

Two state respondents zeroed in on ecology from different directions: *North Dakota's* postsecondary respondent expressed his concern, "This agency views heating as the area of the energy crisis which will hit North Dakota the hardest. Our view results from the reported forthcoming shortage of oil and gas at a time when state institutions have been converting their heating plants from coal to gas-oil fired capabilities. Oil-gas fired units have been determined by our engineers and others to more nearly comply with air pollution standards and can be purchased and installed at a fraction of the cost of coal-fired units with ash handling equipment and air pollution control equipment." And *Nebraska's* elementary-secondary respondent noted, "The ecologist is going to become the 'voice crying in the wilderness for a while.'"

FACILITIES DESIGN COULD IMPROVE

Colorado's postsecondary respondent reported the solar heating system presently being designed for the North Campus of Denver's new Community College. He said, "The crisis will force the consideration of alternative heating sources in the design of all buildings." And in Oregon (a state with an early experience in the energy crisis) the postsecondary respondent opined, "The long-term effect will undoubtedly be considerably greater concern for the life-costing of facilities including the supply of heat and other utilities. This will include such measures as more control, lower light levels and in general, more specific building design parameters."

The postsecondary respondent in Tennessee added to his report, "The long run will see efforts made to: (a) seek out new energy sources, (b) design buildings with the idea of minimizing energy usage, (c) continue to maintain the conservation measures implemented in the short run and (d) convert existing energy consumption devices which are dependent on scarce energy resources to those sources which are relatively more abundant."

UNIQUE SCHEDULING ALTERNATIVES CONSIDERED

Out of state brainstorming sessions have come contingency plans that go well beyond most energy crisis considerations.

Florida's respondent included materials outlining "Educational Alternatives for Energy Conservation" that included: (1) standard reductions in energy use in buildings and by buses, (2) double sessions, later starting hours, elimination of night classes, (3) rescheduling the school week (four-day week with longer day) and (4) substituting a competency-based education system for the time-based system as follows:

"Day Schools: Open schools for two days per week only for critical instruction, diagnostic testing, assignments, advising and learning assessment. Teachers serve as consultants in residence to advise on educational strategies, programs and materials to provide for home/community-based instruction; nonworking mothers (with appropriate training) serve as 'instructional aides' working in homes or neighborhoods. Individual teachers would be responsible for several such neighborhood learning environments. Available technology such as exportable learning materials, self-instructional programs, workbooks, independent study packages, newspapers and educational televisions for documentaries, rebroadcasts of significant news shows, etc., would be used. Residential schools: Close one-half of facilities and utilize residence halls, library, cafeteria and fraternity house recreation rooms for instruction; increase use of independent study and available technology."

From the same set of materials came this recognition of an opportunity: "If schools, colleges and universities have to alter their operations significantly, there will be opportunities to try alternative means Small pilot efforts aimed at trying such alternative means of education should be encouraged. The department (of education) is currently analyzing available resources to identify funds If such projects are undertaken, the commissioner (of education) will submit a report to the 1975 legislature including: (1) the energy economies realized, (2) their educational effectiveness and (3) the feasibility of broad-scale implementation of those ventures that proved effective in educational outcomes and energy conservation."

South Dakota's state board of education was looking forward when it passed a resolution in December stating: "... during the energy crisis affecting all elements of the elementary and secondary education systems in South Dakota, that school governing bodies may direct school administrators and teachers to initiate a system of independent study for pupils for those days when school(s) must be closed due to the unavailability of sufficient fuel to maintain a healthful environment within the school building, and that a maximum of ten (10) such days may be counted as 'days in session' during one school term." Definition of the term *day in session* was extended to include "days the school may be closed due to the energy crisis and the students engaged in independent study at home according to a program of study which has been planned by their teachers." And South Dakota's postsecondary education people are looking at a 4-0-4 schedule, with no school during January and February.

Massachusetts' elementary-secondary reporter stated: "Long-term effects may well prove to be positive. We are restudying the regulations for length of school day and school year Result may be a permanently more flexible approach. Further, we are now more seriously into off-site learning programs, alternative schools and learning packages as options to the traditional concept. This will have significant impact on education. Perhaps most important, the crisis presents the whole community with a rich learning situation which we are urging schools to utilize."

"If time is lost due to energy shortage," said the *New York* postsecondary respondent, "specific arrangements should be made to enable students to complete their work. The closing of elementary and secondary schools and/or the shortening of the academic calendar may present special problems for students in teacher education and other professional programs It may be possible through the utilization of nontraditional methods to make up any class time that is lost due to suspension of regular classes. Methods that should be considered are independent study, media resources, visual materials, field work, etc."

In *Colorado*, the elementary-secondary respondent noted, "The long term will be to relook at the goals and objectives of our schools in terms of this new way of life we have entered. We will need to relook constantly at our use of energy as it relates to instruction and career education. We will need to take another look at the year-round school concept and how we propose to improve the quality of education under these new restrictions. The energy crisis necessitates educators relooking at education and all phases of the educational program."

LESSON PLANS

John W. Gardner, former HEW secretary, has said: "We are all faced with a series of great opportunities—brilliantly disguised as insoluble problems." And so it is with the energy crisis. The need for public education on energy conservation has been most clearly laid out before the educator, and state responses revealed preparations to grapple with it in a variety of ways, either coupling it with environmental-ecological education, or treating it separately.

Elementary-Secondary

Oregon's State Department of Education, apparently well ahead of the pack, has developed energy conservation instructional materials for classroom teachers as well as a handbook for wider use in a statewide adult education program. In cooperation with

this program, community colleges are setting up speakers' bureaus on energy and energy-related topics for use by all public and private agencies, clubs and other organizations.

Washington's respondent reported his state's participation, in cooperation with Oregon and Idaho, in the development of a particularly noteworthy multistate program entitled *Energy and Man's Environment*. Program goals include providing educational materials for teachers covering the concept of energy and its relationship to man and his environment, and an activity guide has been developed to implement these goals.* As a result of its participation in the project, the Washington State Department of Public Instruction's Curriculum and Instruction Division is developing a short-range higher impact program to be completed in early February.

New Hampshire's elementary-secondary respondent informed ECS that "the state board and the state department of education recommend that all schools develop and implement educational programs which will make students, their parents and other members of the community knowledgeable about the energy crisis and its associated problems. An awareness of how to help solve these problems, and motivation toward their solution, should be an integral part of every program. Both immediate and long-range educational programs are needed. It is recommended that the long-range energy education programs be accomplished through the implementation by each school district of the provisions contained in *Environmental Education for New Hampshire: A Plan for Community Development*, which was developed by the Environmental Education Planning Council of New Hampshire."

"There are a number of energy crisis workshops to be implemented during the remainder of the school year which will offer inservice opportunities to Illinois teachers," reported that state's respondent. "Teachers have initiated student projects and investigations centered around the concept of energy supply and demand. I am hopeful that these activities will increase an awareness of our interdependence with natural resources. This shortage has indicated to some of us, and possibly for the first time, the finite character of our resources. The lessons to be learned are many and varied and should enhance our environmental education efforts."

Iowa's special efforts include information packets prepared for "Energy Awareness Week" (Dec. 10-15) and booklets for continued instruction: *Energy Awareness: Resources for Teachers*; *Our Energy Needs: Questions and Answers*; *A Booklet of Suggested Activities*. A one-hour telecast, "A Briefing on Energy," was broadcast by the Iowa Education Broadcasting Network in December. And the Iowa State Education Association has prepared a cassette tape as a teaching aid.

The Pennsylvania State Department of Education recommended specific publications as helpful aids for energy conservation: *Schoolhouse, Wise Use of Energy Pays Off*; *The Gas Line*; *ENERGY Can Neither Be Created . . . Nor Destroyed, But It Can Be Saved!*; and *Department of Commerce Recommendations for Greater Energy Efficiency in Large Buildings*.

And in New Jersey, the adult education bureau is conducting a series of information seminars around the state, while the emergency preparedness bureau distributes curricular and multimedia materials re man-made and natural emergencies.

Postsecondary

The New Hampshire respondent reported that the university system "is planning to develop an energy crisis conservation information and service task force which will

*For further information on this program, contact: *Energy and Man's Environment*, 2121 Fifth Ave., Seattle, Wash. 98121.

research and compile informational and instructional materials for public use. Dissemination by educational television, cooperative extension service, student groups, etc., is contemplated. Effort will be aimed at both immediate conservation techniques in the current crisis as well as in-depth understanding of long-range energy situation and resource development. Also, the University of New Hampshire is providing an advisory body of engineering, ecological, economics and resource development personnel (faculty and staff) to help the state analyze the impact and implications which proposed development of a major oil refinery would have on this state and region."

"Provisions for educational meetings for university employees, energy conservation posters and the use of student newspapers to keep students aware of the program and to encourage them to assist in the program" are among the plans being made by the University System of Georgia, said the state respondent.

The University of Maine—Portland Gorham sponsored a three-day seminar for state participants in December; while the Orono campus created an energy committee to provide information and problem-solving skills to government, industry and business. In conjunction with state agencies, the Maine Public Broadcasting Network is creating an emergency communication system. A one-day conference cosponsored by the governor, "The Energy Crisis and Its Effects on Small Businesses in Georgia," was held at the Georgia Institute of Technology; in Kansas, two universities (K.U. and K.S.U.) are collaborating on statewide workshops on energy conservation.

The university can be used as a resource for state government and industry, noted the Maine respondent, predicting "stimulation of energy conservation on a permanent basis plus closer involvement of the university in an expert resource role to government and industry." Massachusetts' respondent said that the board of higher education is "coordinating the collation and dissemination of the public higher education response to the crisis. Comparable efforts are being handled by various agencies throughout the commonwealth. When completed, such a report will provide a reference of voluntary actions being taken to conserve energy, and it should provide some input into any emergency executive actions to be taken."

Florida is pioneering a computer plan for energy use control in two universities, said a state respondent.* "We are presently negotiating for the acquisition of two IBM System Seven Process Control Computers for use at Florida International University in Miami and Florida Agricultural and Mechanical University in Tallahassee. It is anticipated that both installations will be completed by the end of March 1974 and will have the effect of automatically reducing energy consumption in specific areas to avoid abnormal peaks of consumption, the net effect being a normal load throughout the day." The office of Florida's chancellor of higher education is compiling "a list of faculty members who have demonstrated expertise in the field of energy to insure their availability to other state agencies and industry at large to assist in the resolution of problems arising out of the energy crisis, and additional programs and materials will be developed on a continuing, as-needed basis."

One state, Louisiana, reported that "several two-year curricula in petroleum and/or geological technology have been approved in anticipation of the need for additional trained personnel for oil exploration."

*Phillip F. Ashler, executive vice chancellor, University System of Florida, Tallahassee, Fla.

**FUEL CONSERVATION GUIDELINES
STATE OF FLORIDA**

Reproduced by permission of Mr. Bing, Deputy Commissioner,
Florida State Department of Education

M E M O R A N D U M

TO : All District School Superintendents
All Community College Presidents
All State University Presidents

FROM : Floyd T. Christian

SUBJECT : Conservation of Energy

The rapidly changing information we are receiving from the federal government indicates that Florida will face a severe fuel shortage this winter. Our petroleum supplies are currently estimated to be 20 percent less than what we would ordinarily need this winter.

Governor Askew has requested that substantial energy conservation measures be taken to reduce energy consumption in all public buildings, including our schools and courthouses.

In view of the critical shortage of energy which has been forecast for this winter, we should all act together to conserve all forms of energy. Only through cooperation by all can the state and nation survive this shortage without more serious consequences.

This can be accomplished through relatively simple, quite obvious and inexpensive means:

- . Turn off unnecessary lights.
- . Reduce the use of heating and air conditioning.
- . Re-schedule extra-curricular activities from night to afternoon.
- . Establish car pools and tune vehicle motors for optimal performance.
- . Adjust oil burners for proper combustion level.
- . Double up on staff travel and re-examine travel schedules so that the most fuel conserving methods of travel are utilized. Or, to go back to a World War II slogan, "Is this trip really necessary?"

The possibility exists that if measures toward conservation of energy are not developed and enforced within the framework of our educational system, other agencies of government will develop and enforce standards which could result in serious curtailment of school, college and university operations.

My staff is at the ready and on stand-by to provide any assistance you may need in implementing these conservation measures.

With your voluntary cooperation and implementation of the following suggestions, the impact of this energy crisis can be blunted. I encourage your adoption of these and any other measures necessary to reduce fuel and electric power consumption.

PLANT OPERATION

- . Turn off lights in rooms when not occupied during class hours. Reduce corridor lighting to the minimum necessary for safety.
- . Set thermostats to a level no higher or lower than necessary for health and comfort. This may mean that many students and faculty members will wear sweaters inside buildings.
- . Eliminate all unnecessary and decorative outside lighting.
- . Heating systems should be checked on a regular basis for combustion efficiency. This means giving special attention to changing filters in the air handling systems in accordance with the manufacturer's recommendations and removing scale in boilers.
- . Keep windows and doors closed while heating the buildings.
- . Seal off unused rooms and close heating vents.
- . Turn off lights on clear days in buildings with a sufficient amount of glass which can emit the needed amount of natural, non-glare light.
- . Re-schedule night functions in buildings, eliminate non-instructional night time activities and re-evaluate use of buildings by non-educational groups at night and on weekends.
- . Re-examine the use of night security lights, internal and external, reducing illumination where possible.
- . Repair leaking hot water faucets, thus conserving two resources at one time.

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Memo
Page 3

- . Review levels of light illumination to insure that the minimum number of foot candles only are being provided in instructional areas.
- . Reduce the number of hours devoted to night time custodial cleaning programs.

TRANSPORTATION

- . School districts should order school bus drivers not to exceed a maximum speed of 40 m.p.h. regardless of the type of highway or trip.
- . Local districts should use school buses only for home-school/school-home transportation. This would mean that all extra-curricular trips, not deemed essential, would be eliminated.
- . School districts should set up refresher training sessions for school bus drivers, providing instruction on maximum speed, rate of acceleration from stops and mechanical condition of buses. These refresher sessions should be taught by local transportation supervisors or garage foremen.
- . Garage mechanics should give extra and immediate attention to tuning motors of buses to maintain maximum efficiency.
- . Consolidate passenger stops, where safety permits, and reduce the number of bus stops.
- . Carefully study student passenger loads to see if a smaller bus may replace a larger bus.
- . Study route plans to determine if empty bus miles can be reduced.

APPENDIX B

FUEL CONSERVATION GUIDELINES FOR SCHOOL BUILDINGS STATE OF MINNESOTA

Reproduced by permission of F. D. Bright, Deputy Commissioner,
Minnesota State Department of Education

NOTICE TO ALL MINNESOTA SCHOOL DISTRICTS

Some school districts will run short of fuel this year and since each building is a unique system, each school district must immediately begin developing a plan for conserving fuel and in the event of complete fuel exhaustion a plan for building "shutdown." The building design architect and engineers should be contacted for a building "shutdown" and "startup" procedures list. These recommended procedures can be assigned to qualified district personnel or contractors familiar with the systems in the event of fuel exhaustion. A plan for protection of building contents from the effects of reduced temperatures must be included as well.

Three basic strategies are suggested.

A. FUEL CONSERVATION TO LOWER THE TOTAL FUEL DEMAND IN COLD WEATHER

1. Ask building occupants to wear warm clothing and reduce the building operating temperatures as follows:

Occupied areas - 68°F
Auditorium - 68°F Occupied - 50°F Unoccupied
Cafeteria kitchen - 65°F - Dry Food Storage - 40°F
Gymnasium - 60°F Occupied - 50°F Unoccupied
Locker and Shower Rooms - 68°F
Basket and Drying Rooms - 40°F
Shops - 60°F
Swimming Pool Room - 70°F - Water - 75°F
Lavatories, Hall and Corridors - 50°F

NOTE: If your fuel oil suppliers cannot deliver fuel when needed, serious consideration should be given to dismissing school and reducing building temperatures to a safe minimum point (see B), which would prevent freeze-ups of heating and water systems rather than conduct classes in the hopes that fuel supplies might be replenished.

2. Ask building occupants to avoid introduction of cold air by opening windows or holding doors open and set all outside air intakes to take a minimum of cold air or cycle them periodically as required.
3. Ask building occupants to avoid use of all power exhausts during cold weather by scheduling educational experiences considering the weather and provide a minimal building exhaust by lowering power settings or periodic cycling of exhaust air handling equipment.
4. Ask building occupants to prudently use electricity and lighting and constantly check the building for wasted electrical energy use.

5. Ask building occupants to use hot water sparingly and set potable hot water to 130°F.
 6. Ask building occupants to report drafts and other wasted energy. Seal and insulate where feasible.
 7. Increase attention to (and expenditures for) building systems maintenance! (e.g. clean filters, lubricate fans, check steam pipes, damper controls, etc. to improve the efficiency of fuel use.)
 8. Implement "shutdown" procedures in unused spaces when feasible.
 9. Close school before all fuel is exhausted to avoid the problems of a complete building "shutdown" by implementing strategy B.
- B. CLOSE SCHOOL WHILE MAINTAINING INSIDE TEMPERATURES ABOVE FREEZING.**
1. Reduce building temperatures to a reasonable minimum (e.g. 40°F).
 2. Seal all outside air intakes (e.g. taped polyethylene covers on all unit ventilator intakes, roof intakes, etc.).
 3. Seal all exhaust openings (e.g. cover all roof exhausts and damper units similar to #2.)
 4. Heat building by cycling the system if the controls cannot be set to a low minimum temperature such as 40°F. Maintain temperatures throughout the building above freezing!
 5. Do not heat domestic potable hot water but do operate continuously the domestic water circulating pumps.
 6. Open all access panels (and selected ceiling panels), doors, and cabinet doors to minimize the possibility of freeze-ups in enclosed spaces.
 7. Provide for continuous monitoring of temperatures throughout the building during subfreezing outside air temperatures by keeping maintenance personnel in the building 24 hours a day.
- C. IMPLEMENT COMPLETE "SHUTDOWN" PROCEDURES PRIOR TO COMPLETE FUEL EXHAUSTION IN SUCH A WAY AS TO MINIMIZE DAMAGE TO THE BUILDING AND CONTENTS.**
1. A complete building "shutdown" procedures list will be sent to each district only as a backup to the recommendations of the building design engineers recommended "shutdown" procedures.

Questions concerning this notice and the checklist to follow should be directed to Mr. William Lavelle, Assistant Director for Operations, telephone: (612) 296-2288.

C. EXHAUSTED FUEL SUPPLY: FUEL UNAVAILABLE TO PREVENT FREEZE-UPS IN FACILITIES
BUILDING "SHUT-DOWN"
SYSTEMS CHECKLIST
(VERIFY WITH DESIGN ARCHITECT & ENGINEERS)

1. Boiler (Steam Boiler)
 - (a) Drain boiler and vent to atmosphere
2. Condensate-Vacuum Pump
 - (a) Run pump on vacuum for an extended period to evacuate as much water as possible from return lines to pump. (Waste condensate to floor drain, not to boiler.)
 - (b) Disassemble piping at union nearest condensate -- vacuum pump
 - (c) Drain condensate receiver tank and remove drain plug at bottom of receiver
3. Condensate Pump
 - (a) Repeat steps (2b) and (2c)
 - (b) Pump out receivers of pitted pumps and underground condensate lines
4. Auxiliary Heating Equipment
 - (a) Fuel oil heaters
 - (b) Hot water coils
 - (c) Converters
 - (d) Hot water storage tanks
 - (e) Gas/oil water heaters
 - (f) Float and thermostatic traps
 - (1) (a) through (e) disassemble waterside piping at union, drain equipment, and remove drain plug where applicable
5. Air Compressor, Air Dryer, Oil Filter
 - (a) Shut off electric power
 - (b) Drain to remove entrained water
6. Floor Drains (Boiler rm., mechanical rms., rest rms., cafeteria, kitchen, shower rms., etc.)
 - (a) Use plunger to evacuate water from trap
 - (b) Fill traps with antifreeze solution (20% Glycol - 80% Water)
7. Hot Water Heating Boiler, Hot Water Heating Systems, Potable and Chilled Water Systems

The advice of the mechanical engineer who designed the water systems (potable, chilled water and hot water heating systems) should be followed in the draining of these systems.

Gas or oil fired furnaces or hot water heaters (where applicable) shut down according to manufacturers direction.

- (a) A possible alternative to draining the hot water heating system would be to introduce an antifreeze solution into the system. CAUTION: Antifreeze solution must not under any circumstances be introduced into the domestic water system because of its toxic effect.
- (b) If it is decided not to drain the water systems, frequent checks daily are necessary to insure that the pumps are functioning and circulating water throughout the system.
- (c) All control valves on radiation and coils should be positioned to insure full flow through radiation and coils. All fresh air and exhaust dampers must be completely closed.

8. Hot Water Heating System (Draining System)

- (a) Hot Water Boiler
 - (1) Shut off feed water
 - (2) Drain boiler
 - (3) Break unions in piping to facilitate drainage
- (b) Primary Pumps
 - (1) Drain plug removed from pump housing
 - (2) Break union to promote drainage
- (c) Converters
 - (1) Remove from piping system and invert to facilitate drainage of "u" bends in coil
- (d) Stainers (Upstream of control valves)
 - (1) Remove plug for drainage
- (e) Piping
 - (1) Check drain valves for drainage
- (f) Trapped Portions of Piping (Primary and Secondary System)

Select one or more options:

 - (1) Blow out with compressed air
 - (2) Drill hole in piping, tap hole for insertion of drain plug before filling system. (Where accessible.)
- (g) Secondary Pumps

(See 8(b) - Hot water heating system)
- (h) Hot Water Heating Coils (Radiation, convectors, central systems, univents)
 - (1) Remove plug in stainer upstream of control valve
 - (2) Break union in piping
 - (3) Remove drain plug in coil
 - (4) Remove air vent in coil
- (i) Expansion Tank
 - (1) Drain

9. Potable Water Systems (Draining System)

- (a) Shut off water supply to building at water meter
 - (1) Protect water meter from freeze damage by removal of drain plug at base of meter
- (b) Open all cold and hot water faucets throughout building and keep open to aid drainage
- (c) Drain hot water storage tank
- (d) Blow out with compressed air all trapped portions of the piping system
- (e) Open drain valves in low spots of piping system
- (f) See 8(f)
- (g) Prop all doors to lavatories, pipe chases, cabinet sinks, and all rooms containing potable water systems
- (h) Remove portions of ceiling tiles to equalize temperatures
- (i) Sinks, water closets, urinals
 - (1) Remove water from traps and fill traps with antifreeze solution (20% Glycol - 80% Water)

10. Chilled Water Systems

- (a) Under supervision of design engineer or refrigeration service organization complete draining of chilled water piping e.g.
 - (1) Refrigeration equipment
 - (2) Refrigeration equipment pump down
 - (3) Cooling tower circuit

11. Steam Heating Coils (Radiation, Convectors, Central Systems, Univents)
 - (a) Steam traps -- disassemble and remove trap element to facilitate drainage
 - (b) Remove drain plug from heating coils
 - (c) Remove plug in strainer ahead of heating coil valve
12. Swimming Pool
 - (a) Drain pool slowly when pool water reaches 35°F.
 - (b) Protect all drains as previously mentioned. See 6.
 - (c) Protect pool water heaters the same as converters or heat exchangers
 - (d) Drain filter tank
 - (e) Drain chlorine and soda ash barrels
 - (f) Protect untrapped drains (e.g., scum gutters) as mentioned in 8(f),(2).
 - (g) Drain all strainers
13. Footings - Rooms with footings directly below floor e.g., basement rms., and single floor buildings could give problems - attempt to keep above 32°F.
14. Fire Protection Equipment Systems (Piping and Ancillary Equipment)
 - (a) Sprinkler systems (wet pipe)
 - (b) Piping systems (wet pipe) (e.g., standpipe and hoses)
 - (c) Fire Extinguishers
 - (d) Fire Insurance Company
 - (a) & (b) If freezing conditions within the facility indicate that the fire suppression piping system will be damaged if the systems are not drained, permission must be obtained from the state fire marshal or local fire authorities to drain system
 - (c) Fire Extinguishers
 - (1) Have fire extinguishers serviced to insure an operable state in freezing temperatures
 - (d) Fire Insurance Company
 - (1) Notify fire insurance company if fire protection systems are to be drained
 - (2) Check Insurance Coverage

SYSTEM CHECKLIST SPECIALIZED EQUIPMENT - EXAMPLES

1. Gas and Gas/oil Burners (heating boilers)
 - (a) Follow instructions of gas/oil burner service organization, particularly instructions especially relating to flame safeguard equipment, and specialized valves, e.g., hydromotors.
2. Water Softeners (boilers and potable water) Drain
3. Refrigerators, Walk-in Coolers, Freezers, Milk Coolers (cafeteria, kitchen, home ec room, etc.)
 - (a) Empty contents
 - (b) Prop open doors
 - (c) Shut down procedures as directed by refrigeration service organization
4. Water Coolers
 - (a) Cut electric power and drain
5. Dishwashers, Steam Kettles, Steam Boilers, Garbage Disposals (cafeteria, kitchen, home ec) Drain Equipment
6. Fresh Foods and Other Perishable Items of Food - Store in Safe Area
7. Booster Hot Water Heaters (cafeteria, showers, phys. ed.) - Drain as outlined for converters 8(c),(1)

8. Musical Instruments (Protect from freezing)

- (a) Woodwind Instruments
- (b) String Instruments
- (c) The combination of changes in humidity and freezing temperatures will cause woodwind instruments to crack

9. Electronic and AV Equipment (Protect from freezing)

In general, any audio-visual equipment subjected to freezing should be allowed to warm up to room temperature before using. (12 to 24 hours, depending upon size and enclosure)

In case of equipment with cooling fans, servo units, and friction drive belts, the drive mechanisms should be checked for sticking -- and belts for cracking.

Special care should be exercised with video tape recorders, as the heads (particularly on older units) become brittle in cold temperatures.

In addition, audio-visual materials such as films, filmstrips, audio and visual tapes, etc., should also be allowed to warm up to room temperature before using.

10. Business and Office Equipment Machines (Check with supplier)

11. Fire Extinguishers (Protect from freezing)

12. Chemicals, Paints, Varnishes (Protect from freezing)

13. Clocks - Building System Clocks - Turn off electricity to system to prevent damage

14. Science Center - plants, laboratory animals, chemicals - Protect from freezing

15. Air Compressors

(a) Shut off electric power

(b) Drain storage tank

16. Art Equipment and Supplies (Protect from freezing)

(a) Sinks with clay traps

(b) Liquid tempera

(c) Acrylic artists colors

(d) Glue and paste

(e) Some supplies in aerosol cans

(f) Natural clay requires extended time to thaw out

(g) Clay work in progress could split and crack

(h) Clay in containers could split open packaging

This list is an attempt to alert personnel responsible that many items are in need of protection from freezing. It is suggested that the building inventory be checked for additional items that can be added to this list.

CAUTION: The police and fire authorities should be notified of building shut down to cooperate with school authorities to reduce vandalism.

SUPPLIES PROTECTION FROM FREEZING TEMPERATURES

Acids	Bug sprays	Developers, photo	Liquid polish
Ammonia	Caulking compounds	Disinfectants	Liquid soap
Antiseptics	Caustics, liquid	Distilled water	paints
Art Paints	Cement, construction	Drain cleaner	Shellac
Baking Powder	Cement, liquid	Electric components	Thermometers
Baking Soda	Chemicals	Electronic tubes	Thinners
Batteries, electric	Clay	Enamel	Varnish removers
Belt dressings	Cleaning compounds	Eradicator inks	Waxes, floor
Biology specimens	Compounds, chemicals	Glue	finishes
Boiler compounds	Compounds, patching	Insecticides	
Brass polishes	Correction fluid, stencil	Lacquers	

APPENDIX C

(SAMPLE - NONTECHNICAL)

BASIS FOR COMPUTING DEGREE HOUR REQUIREMENTS STATE OF MICHIGAN

Reproduced by permission of Philip Kearney, Associate Superintendent
Michigan State Department of Education

In order to determine the relative fuel savings that would be achieved under any one of the several heating alternatives presented, one must compare the change in temperature required times the number of hours the change is desired for any given alternative compared to another. This figure is defined as "degree hours required" and is computed by utilizing the following formula:

$$\text{DHR} = (t_i - t_o \times \text{hrs}), + (t_i - t_o \times \text{hrs}) + \dots$$

Where: DHR = Degree hours required
 t_i = Minimum inside temperature desired
 t_o = Average outside temperature

Thus, if the average outside temperature for a given calendar week is 20°F and you wish to maintain a minimum inside temperature of 68°F for eight hours a day for five days, and 60°F for the remainder of the hours in that week, the computation would be as follows:

$$\begin{aligned}\text{DHR} &= (68^\circ - 20^\circ \times 40 \text{ hrs}) + (60^\circ - 20^\circ \times 128 \text{ hrs}) \\ &= (48^\circ \times 40 \text{ hrs}) + (40^\circ \times 128 \text{ hrs}) \\ &= 1,920 + 5,120 \\ &= 7,040 \text{ degree hours required}\end{aligned}$$

Thus, the three important terms in the formula are: (1) The average outside temperature; (2) the minimum inside temperature desired; and (3) the number of hours any given minimum inside temperature is desired. The first term is outside man's control, but can be reasonably estimated from past experience. Should an unseasonably warm winter (or cold winter), fuel savings will be largely dependent on manipulation of the second and third terms in the formula. The alternatives presented reflect differing manipulations of these two terms.

The first term, the average outside temperature, remains constant for any given month in the several alternatives. The figures used are given below and were derived from data provided by the Environmental Data Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. These average monthly temperatures were calculated by taking the monthly averages for the past thirty years for each of Michigan's ten weather regions or divisions, computing 30-year monthly averages for each division, and then computing state monthly averages. The averages used are as follows:

September	60°F	February	22°F
October	50°F	March	30°F
November	37°F	April	44°F
December	25°F	May	54°F
January	20°F	June	64°F

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In calculating percentage of fuel savings, the divisor remained constant at 144,256 degree hours required. This figure represented the degree hours required for heat at "normal levels" for the entire 1973-74 school year. Normal levels are defined as:

- (a) 40 hours of 68°F per week
128 hours of 60°F per week
for 36 weeks
- (b) 168 hours of 60°F per week
for 4 weeks

It should be recognized that past degree hour requirements undoubtedly exceeded this figure of 144,256 DHR, since most schools would be heating at the 72°- 74°F range during instructional hours and dropping to temperatures somewhere above 60°F for noninstructional hours, perhaps in the neighborhood of 65°- 68°F. In effect, then, the 144,256 DHR already reflects voluntary conservation measures undertaken by all schools. It is estimated that these voluntary measures would produce in the neighborhood of a 5% fuel savings. To the extent that this is true, the fuel savings projected under each of the alternatives is an overestimate of total fuel savings.

For those districts wishing to refine these estimates (for example) due to average temperatures in their region higher or lower than the estimated state average), they may contact Dr. Philip Kearney, Department of Education, (517) 373-3909.

December 1973

Page

EDUCATION COMMISSION OF THE STATES, 1860 Lincoln, #300, Denver, CO 80203(303) 893-52

NAME OF RESPONDENT: _____

For ECS Use Only

TITLE: _____

State _____

TELEPHONE: _____

Org. **ES**

Mail _____

Return _____

Any questions? Get the answers from Doris M. Ross, Department
of Research and Information Services, at the above address.

1. Has the governor of your state issued an energy crisis executive order which affects elementary/secondary education? Yes _____ No _____
(or postsecondary)

a. If so, please summarize here or enclose text: _____

2. Do you feel that emergency legislation will be necessary to enable your state's elementary/secondary schools to cope with the energy crisis? Yes _____ No _____
(or postsecondary)

a. If so, please explain what kind of legislation will be necessary: _____

- b. Has such legislation been prepared or has it been introduced? Yes _____ No _____

Legislation is being/has been prepared by _____

Legislation has been introduced under Bill No. _____

Please summarize legislation here or enclose text: _____

ATION COMMISSION OF THE STATES, 1860 Lincoln, #300, Denver, CO 80293 . . . (303) 893-5200

Has your agency issued guidelines for coping with the energy crisis to school districts?

Yes _____ No _____

If so, please summarize here or enclose text:

Generally, what energy conservation measures are being implemented now in your state's elementary/secondary schools, either in response to state directives or independently? (or postsecondary)

(or postsecondary institutions)
Has your agency prepared further recommendations for school districts, or have individual districts filed plans with your agency, for coping with the energy crisis if it becomes more acute? For example, dismissal of classes during cold periods, a shortened school day or week, cutbacks in transportation services, curtailing or eliminating extracurricular activities. Please summarize here or enclose text:

EDUCATION COMMISSION OF THE STATES, 1860 Lincoln, #300, Denver, CO 80203 (303) 893-57

6. Use this page to express your estimate and/or opinion on (1) which area of the energy crisis (i.e., transportation, heating, electricity, others) will hit your state the hardest, and (2) what will be the short- and long-term effects of the energy crisis in your state's elementary/secondary schools.
(or postsecondary)

7. If you are aware of special programs, curriculum materials, energy conservation handbook etc. being developed or used in the elementary/secondary schools in your state, please describe them below or enclose copies: (or postsecondary)

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1973-1974**

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Vice Chairman

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